

Application Number 10/573,239  
Amendment dated June 23, 2008  
Response to Office action of March 24, 2008

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**Amendments to the Claims:**

This listing of claims will replace all prior versions and listings of claims in the application:

**Listing of Claims**

Claim 1 (currently amended): A tunnel diode in which the collector comprises a band gap material, said band gap material being a crystal material having filled zero temperature valence band and empty conductive band, wherein said collector is separated from an emitter by a gap, said gap being evacuated or filled with an inert gas under low pressure.

Claim 2 (currently amended): The tunnel diode of claim 1 ~~wherein said additionally comprising an emitter~~ comprises a metal coated with a layer of a band gap material.

Claim 3 (currently amended): The tunnel diode of claim 1 in which the collector comprises a metal having a layer of band gap material deposited thereupon ~~a metal collector.~~

Claim 4 (currently amended): The tunnel diode of claim 3 in which said layer of band gap material has a thickness greater than the mean distance of relaxation of electrons tunneling from said emitter.

Claim 5 (previously presented): The tunnel diode of claim 1 in which the band gap material is selected from the group consisting of: a semiconductor, a hetero-structured semiconductor, a dielectric, a diamond material, an alkali metal oxide and an alkaline earth oxide.

Claims 6 (previously presented): The tunnel diode of any claim 1 in which the band gap material is selected from the group consisting of: Ge, Si, GaAs, SiC and AlGaAs.

Claim 7 (currently amended): The tunnel diode of claim 1 in which ~~the electrodes are separated by a~~ said gap is in the range 1 – 100nm.

Claim 8 (currently amended): The tunnel diode of claim 1 in which ~~the electrodes are separated by a~~ said gap is in the range 1 – 10nm.

Claim 9 (canceled).

Claim 10 (previously presented): A vacuum diode heat pump comprising the tunnel diode of claim 1.

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Claim 11 (previously presented): A heat to electricity converter comprising the tunnel diode of claim 1.

Claim 12 (currently amended): A method for promoting the tunneling of electrons having an energy level higher than the Fermi level of an emitter, from ~~[[an]]~~ said emitter surface, comprising the step of positioning a collector comprising a band gap material at a distance within the tunneling range of said electrons, said band gap material being a crystal material having filled zero temperature valence band and empty conductive band and said distance between said emitter and said collector being evacuated or filled with an inert gas under low pressure.

Claim 13 (currently amended): A method for ~~preventing~~ suppressing back tunneling of electrons in a tunnel diode comprising the step of coating a collector with a layer of a band gap material, said band gap material being a crystal material having filled zero temperature valence band and empty conductive band, and said collector being separated from an emitter by a gap, said gap being evacuated or filled with an inert gas under low pressure.

Claim 14 (previously presented): The method of claim 12 in which the collector comprises a layer of band gap material deposited on a metal collector.

Claim 15 (currently amended): The method of claim 14 in which said layer of band gap material has a thickness greater than the mean distance of relaxation of electrons tunneling from said emitter.

Claim 16 (previously presented): The method of claim 12 in which the band gap material is selected from the group consisting of: a semiconductor, a hetero-structured semiconductor, a dielectric, a diamond material, an alkali metal oxide and an alkaline earth oxide.

Claim 17 (previously presented): The method of claim 12 which the band gap material is selected from the group consisting of: Ge, Si, GaAs, SiC and AlGaAs.

Claim 18 (currently amended): The method of claim 12 in which ~~[[the electrodes]]~~ said collector and said emitter are separated by a gap in the range 1 – 100nm.

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Claim 19 (currently amended): The method of claim 12 in which [[the electrodes]] said collector and said emitter are separated by a gap in the range 1 – 10nm.

Claim 20 (canceled).

Claim 21 (new): The tunnel diode of claim 2 in which said emitter has a layer of band gap material deposited thereupon.